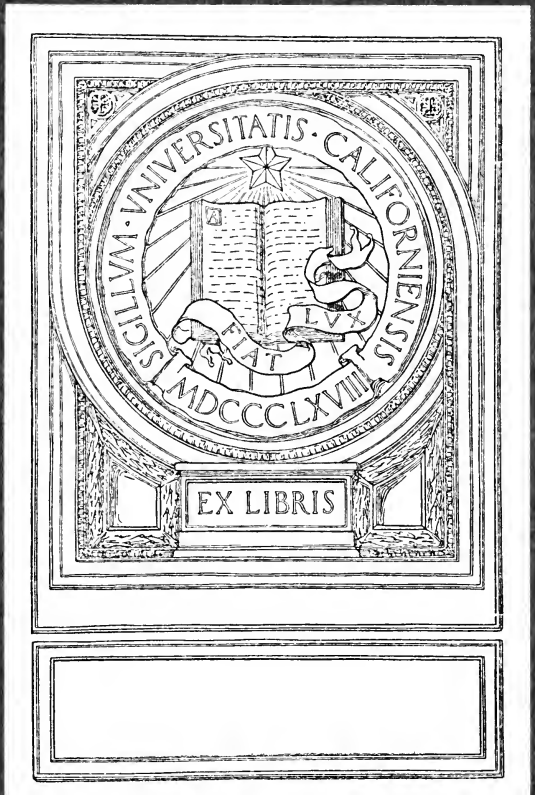
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THE COMMERCIAL VALUE

OF

WIRELESS TELEGRAPHIC COMMUNICATION

WITH THE

ANDAMAN & NICOBAR ISLANDS.

ADDRESS BY

COL. R. C. TEMPLE, C.I.E.,

Chief Commissioner of the Andaman and Nicobar Islands.

DELIVERED AT THE

BENGAL CHAMBER OF COMMERCE,

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THE COMMERCIAL VALUE OF WIRELESS TELEGRAPHIC COMMUNICATION WITH THE ANDAMANS AND NICOBARS.

At the invitation of the Committee of the Bengal Chamber of Commerce, an address was given, in the rooms of the Chamber, on Tuesday, the 6th February 1900, at 3-30 P.M., by Colonel R. C. Temple, C.I.E., Chief Commissioner of the Andaman and Nicobar Islands, on "The commercial value of wireless telegraphic communication with the Andamans and Nicobars."

The Hon'ble Mr. Allan Arthur, President of the Bengal Chamber of Commerce, took the chair, and the following gentlemen were also present:—

The Hon'ble Sir A. C. Trevor, K.C.S.I.; Brigadier-General Sir Alfred Gaselee, K.C.B.; Sir Patrick Playfair, Kt., C.I.E.; the Hon'ble Mr. James Buckingham, C.I.E.; Mr. J. P. Hewett, C.S.I.; Secretary, Government of India, Home Department; Mr. C. E. Pitman, C.I.E., Director-General of Telegraphs; Mr. T. Higham, C.I.E., Inspector-General of Irrigation; the Reverend Father Lafont, C.I.E.; the Hon'ble Mr. C. W. Bolton, C.S.I., Chief Secretary to the Government of Bengal; the Hon'ble Mr. D. F. Mackenzie; the Hon'ble Mr. E. N. Baker, Secretary, Government of Bengal, Financial Department; Mr. F. G. Maclean, Deputy Director-General of Telegraphs; Lieutenant-Colonel G. W. Anson, I.S.C.; Messrs. A. A. Apcar and J. H. Apjohn; Captain Atkinson; Mr. D. C. Blair; Captain A. H. Bingley, I.S.C.; Messrs. W. J. Bradshaw, R. J. Browne, E. Cable, D. Campbell, J. Campbell, H. E. Chappel and W. Corkhill; Captains Conran, I.S.C., and A. R. Dick, I.S.C.; Messrs. D. Graham and W. F. Greenhill; Captain A. Gywn, R.I.M.; Messrs. G. S. Hannah,

J. W. Hensley, D. Hooper, George Irving, A. M. John, H. F. King, C. Klopp, O. C. Lees, C. Little, J. MacJohn, R. D. Mehta, C.I.E., A. H. C. Morrison, J. Nicoll, H. S. Olphert and C. R. Orr; Captain I. Philipps, I.S.C.; Messrs. J. M. G. Prophit and R. J. Reid; Major Renny, R.A.; Messrs. Percy Sarkies, M. A. Simpson and C. E. Smyth; Mr. W. Parsons, *Secretary* and Mr. H. M. Haywood, *Assistant Secretary*.

The CHAIRMAN in opening the proceedings, spoke as follows:—

GENTLEMEN,—At various times mainly on the initiation of Sir Patrick Playfair, the Committee of the Chamber have had before them for consideration the important question of connecting the Andaman and Nicobar Islands with the mainland of India by telegraph.

You are aware that it is in the neighbourhood of these islands that cyclones, which are so prevalent in the Bay of Bengal, have their origin.

It is thought that, if the Meteorological Department were in telegraphic communication with these islands, they would be able to get more timely and more accurate information of the approach of cyclones, and thus be the means of averting some frightful disaster to shipping.

The cost of making the connection is estimated, under the old system of laying cables, at a very large sum, and, while I have no doubt the Government of India are in entire sympathy with the proposal, the state of their finances during the last few years has precluded their undertaking the work.

It seems to me a fortunate circumstance that Colonel Temple, the Chief Commissioner of the Andaman and Nicobar Islands, should have devoted a portion of his well-earned leave in England to studying the Marconi system of telegraphing with special reference to its application to the connection between the Andamans and India.

I am sure we are deeply indebted to him for having accepted the invitation of the Committee to come here this afternoon and inform us upon this important subject.

I have no doubt Colonel Temple's address will be highly interesting, not only from a scientific point of view but from the point of view to which I have referred.

COLONEL TEMPLE then delivered the following address :—

In responding to the courteous invitation of the Committee of the Bengal Chamber of Commerce to address its members on the commercial value of wireless telegraphic communication with the Andamans and Nicobars, I feel some diffidence in speaking before a body of gentlemen, some of whom at any rate are experts, in parts, at least, of the whole of my subject. But I hope, nevertheless, to be able to say enough to-day to show my audience that the subject is of real importance to the conduct of their business, and as a means of reducing the existing sources of anxiety as to forecasts and as to the action dependent on the accuracy of forecasts.

This being the object of my remarks, I propose—

(1) without using technicalities to explain the nature of wireless telegraphy,

(2) to explain its requirements, *i.e.*, the implements, structures and so on necessary, and the limitations of its usefulness, with some remarks on the likely cost,

(3) to discuss its value to the trade and commerce with which you are concerned,

(4) and lastly to discuss the special value of wireless telegraphic communication with the Andamans and Nicobars.

Let me now proceed to the first point : the nature of wireless telegraphy. Wireless telegraphy is called wireless because the transmitter used with it can act on a receiver without the intervention of a continuous wire, such as is necessary with ordinary telegraphy, and not because no wire at all is necessary.

A better technical title is etheric telegraphy, because the communication in wireless telegraphy is conducted by ether waves. I hope such a title will never come into use, and merely mention it because of the practical importance of ether waves.

What has been discovered for practical purposes is this. If I set up a pole vertical to the earth,—it must be vertical,—and drop a wire from the top to a special transmitting instrument at the foot, and then set the instrument going, I set up an electrical disturbance in the ether all round that pole. If, also, I have a special receiving instrument anywhere within the radius of the disturbance thus set

up, that receiver will be at once acted on, and I have set up wireless telegraphic communication between the transmitter and receiver.

I will make the point clearer by two common illustrations. The electrical disturbance round the pole is of the nature of the circular waves set up in water, when a pebble is thrown into it. The circular waves in the water are much like the etheric waves round the pole. Again, light is conducted by ether waves, and the eye is a receiver of those waves. If I light a candle, any eye anywhere within a certain radius round that candle receives the light through ether waves. The combustion set up in the candle is the transmitter, the eyes are the receivers, and I have set up, as it were, wireless telegraphy in the shape of ether waves of light.

Now, as we all know, the ether waves of light are strongly affected by the atmosphere. For instance, one sees badly or not at all in a fog or dust: clouds hide the sun and so on. But the atmosphere has practically no effect on the ether waves set up round a wireless telegraph pole. I want you to mark this—wet or fine, fog or sunshine, storm or calm, dark or light, hot or cold, clear or dusty, still or moving,—indeed in any state of the atmosphere that may be imagined, let the proper kind of receiver be brought or moved about rapidly within the charmed circle of the wireless telegraph pole and the receiver will be immediately affected. Briefly, atmospheric conditions do not practically affect wireless telegraphic signals.

The chief point affecting wireless telegraphy in nature to be borne in mind by the practical man is this. The workable circle round the pole is much greater over water or the sea than over the land: nearly twice as great.

Now, the fact that a receiver anywhere within a fixed distance round a wireless telegraph pole will record signals sent from the transmitter suggests the grave commercial objection of tapping messages. This is, however, not so grave as it looks at first sight. Any existing telegraph or telephone wire can be easily tapped, but I do not know that therefore the practice is common. At any rate it can be effectually overcome by the commercial code system. Secret codes can still be used in the wireless telegraph system. And there are besides what is called "tuning," by which the ether waves

generated by a given transmitter will only affect the receiver for which the signals are intended: and also what is called "reflecting," by which the ether waves can be projected in any desired direction and limited to that direction. On the whole tapping is less likely to be effective with wireless telegraphy than with the existing system.

I fear I have dwelt somewhat lengthily on the first point and will now pass on to the second, which is of great importance to all seeking to put an idea into practice. You will want to know what it will be necessary to get, how far the idea can be carried, and approximately what it is likely to cost to carry it out.

The absolute requirements for wireless telegraphy are :—

(1) special receivers and transmitters worked off accumulators,

(2) dynamos for charging the accumulators,

(3) poles or masts or other means for carrying the vertical wires.

But there is no special system of telegraphy used, the ordinary Morse system being that employed. Therefore also ordinary telegraph operators can be employed. Also, except to the instruments, no special repairs are necessary. This means that instruments and establishments are easily procurable: the instruments from the inventors and everything else locally. The crux of the whole question physically lies in the means for carrying the vertical wire. It is here that the physical limitations of the use of wireless telegraphy come in. I have caused to be circulated to those present a printed copy of some practical formulæ and rules of thumb, drawn up by myself, for arriving with sufficiently approximate accuracy at the height of the pole necessary for communicating to any required distance, and *vice versâ* for finding out how far one can communicate with any pole or mast one happens to possess. They are as follows :—

Formula I.

To find height of pole for any given distance

at sea : $\sqrt{\text{distance in sea miles}} \times 12 =$ height of pole in feet.

on land : $\sqrt{\text{distance in miles}} \times 20 =$ height of pole in feet.

Rule of Thumb I.

at sea : multiply the approximate square root of the distance in sea miles by 12 to find height of pole in feet.

on land : multiply the approximate square root of the distance in miles by 20 to find height of pole in feet.

Illustration.

For 65 miles at sea : $8 \times 12 = 96$ feet as height of pole.

30 miles on land : $5\frac{1}{2} \times 20 = 110$ feet as height of pole.

N.B.—The constant effort of those conducting the research into Wireless Telegraphy is to reduce the multipliers 12 and 20.

Formula II.

To find distance workable from a given pole

at sea : $\left(\frac{\text{height of pole in feet}}{12}\right)^2 =$ distance workable in sea miles.

on land : $\left(\frac{\text{height of pole in feet}}{20}\right)^2 =$ distance workable in miles.

Rule of Thumb II.

at sea : divide height of pole in feet by 12 and approximately square the product to find distance workable in sea miles,

on land : divide height of pole in feet by 20 and approximately square the product to find distance workable in miles.

Illustration.

For 96 feet pole : $\frac{96}{12} = 8$; therefore $8^2 = 64$ sea miles is the distance workable at sea.

For 110 feet pole : $\frac{110}{20} = 5\frac{1}{2}$; therefore $(5\frac{1}{2})^2 = 30$ miles is the distance workable on land.

N.B.—The constant effort of those conducting the research into Wireless Telegraphy is to reduce the divisors 12 and 20.

I have little hesitation in saying that it is likely that the obligatory height of the pole will in time be still further reduced, and

conversely that the distance workable from any existing pole will in time be increased. I have chosen the special distances of 65 miles by sea and 30 miles by land for my illustrations, because I apprehend that about 65 miles is the greatest obligatory distance to be overcome between points *en route* from the Asiatic Continent to the Andamans, and about 30 miles is the distance to be overcome between the city offices in Calcutta and the outlying mills.

Let us now examine the physical possibilities of this all important practical point. Neither the Telegraph nor Marine Departments would have any difficulty in erecting a pole or mast up to 150 feet, and both could go higher if required to do so. But let us take 150 feet as the ordinary limit: then according to the formulæ, the limit of communication would be about 156 miles at sea and about 55 miles by land. This is, clearly, enough for the requirements under consideration.

As regards the almost equally important point of materials for the pole or mast: almost anything will do,—wood, steel, iron, brick, stone, or mixture of all, *i.e.*, a chimney, a spire, a tower, a roof, will do. So would a mast partly steel and partly wood, or a mast on a chimney or a building. But the wire cannot be dropped from a cliff or hill-side: the explanation being, I believe, somewhat like this. The root principle of all telegraphic communication, whether by means of a horizontal, *i.e.*, an ordinary, wire, or by means of a vertical wire, is, to use unscientific language, the same; namely it is all conducted through what may be loosely termed concentric ether waves. But if a horizontal wire is employed, it has practically to be continuous to secure a continuous communication. Now, a wire dropped from a cliff is practically a wire horizontal to the earth, and loses at once the peculiar properties of a vertical wire. In fact, for wireless telegraphy of the sort under contemplation, the short wire used must be actually vertical to the earth.

Having thus ascertained what we have to get and what the articles when procured will do for us, I propose to enquire into the cost, both initial and maintenance. I cannot here state any costs precisely, because so much depends on local circumstances. Thus, there may be a local dynamo already in existence, or accumulators may be locally replenishable at a small charge when necessary, or the chimney or mast required may already exist. Again operators may be

already in employment. I can, however, state the points on which money will have to be spent and in some cases the approximate amount. The full figures every intending user would have to work out for himself according to his individual circumstances.

The points of initial cost would be per station as follows: two stations being necessary to complete a communication :—

Instruments complete,	... ...	£ 100
Dynamo for charging accumulators	...	£ 30
Masts (100 to 150 feet)	... ...	£ 80 to 170
Buildings for establishment	... ...	£ ?
The maintenance charges would be per station :—		
Operators and perhaps servants	... ...	£ ?
Repairs to plant and buildings	... ...	£ ?
Royalties to the Patentees	... ...	£ ?

I think I am right in stating that there need not be any fear of prohibitive expense, except in the last item. This is the crucial point, and it seems to me that the commercial future of the Marconi system greatly depends on the action of the patentees, the Wireless Telegraph and Signal Company, Limited, in this matter. At any rate, it is the one point on which any intending user, public or private, will have to fix his attention.

Having considered the idea proposed to us, its requirements and its cost, one naturally passes on to the uses to which it can be put; to consider whether it is worth our while to take it into serious consideration commercially. This brings me to the main point of my address.

I think that all present will admit that there are two questions of the most serious importance to the commerce of Bengal :—

(1) Timely and reliable warnings of storms in the Bay.
(2) Reliable weather forecasts.

Let us then consider whether a system of wireless telegraph stations in the Bay could help us to improve materially the existing means for getting at reliable storm warnings and weather forecasts. I take it that the root principle here is that accuracy in storm warnings and weather forecasts depends on the establishment of a number of meteorological reporting stations all over a given area of sea and land,

e.g., it is not sufficient for accurate warnings and forecasts to have meteorological stations round the Bay. They must also be established, so far as practicable, within it. All this was strongly brought out in this Chamber's correspondence with the Government on the loss of the pilot brig *Coleroon* in November 1891.

Therefore the special value of wireless telegraphy to you is this. It would allow of meteorological stations being set up at places in the Bay commercially and practically inaccessible to cables and land wires.

Now, assuming that the reliability of weather warnings and forecasts depends on these meteorological stations, is it worth while to go to expense in setting them up ? Let us consider.

To take the first question. Storm warnings are valuable for preventing both loss and damage to ships and to the lives and property on board. The tonnage wandering up and down the Bay of Bengal is very large. Here are some average figures for the past 3 or 4 years for Bengal alone, leaving out Burma and Madras. In these years there have left and entered the Bengal ports annually about 4,400 vessels of a combined burthen of about 3½ million carrying tons, conveying about 300,000 passengers and cargoes to the value of upwards of Rs. 11¼ crores, in the coasting trade alone. The question, therefore, of preventing not only the loss of, but also injury to, the ships and to the lives and property on board in so large a trade as this is a most serious one, and of itself sufficient to make one seriously consider any practical proposal for improving protection. The provisions of the Native Passengers Act, imposing heavy expenditure and responsibilities on owners in the matter of life-saving apparatus is one proof of this. The legislation would not have been so exacting on the point had it not been thought that the traffic was large enough to warrant it.

Another important consideration here is that the constant increase in the size of the vessels carrying the trade implies increase in the passengers and the cargoes in each bottom. Therefore, the loss or damage to any one ship is now far more serious than formerly, and in future it will become more serious still.

Now, in considering the value of wireless telegraphy for preventing loss and damage at sea, the chan ge—requiring no explanation in

this place—from sailing to steam tonnage in the Bay is a chief factor, because steamers bound from outside for ports in the Bay and fitted with wireless telegraphic apparatus can run close enough to Galle, or to the Nicobars for that matter, to communicate with the shore without stopping or entering any port or materially changing course. Weather forecasts and especially the direction and force of proceeding and anticipated storms could be communicated to them on entering the Bay. In dangerous and doubtful weather the further course could be directed so as to avoid the indicated storms, or if the necessity arose, the vessel might proceed, without entering a port or stopping, to selected points about the Bay for further information. Shipping owners and agents can consider how much injury and loss could be saved to them in such conditions. Even if accepting a warning involves a longer course than the direct one, it might well be that a vessel would reach its destination in the same or even in less time uninjured, by following a deviated course in comparatively fair weather than it would reach injured by following the direct course through a severe or dangerous storm.

But the essential point for commanders here is the reliability of the warnings they might receive. Wireless telegraphy comes in again here by establishing down the Bay meteorological stations supplementing those already existing round it, and thus greatly increasing the quantity, accuracy and reliability of the information on which the warnings can be based.

The second question, weather forecasts and their value, takes me to the consideration of some very large trade matters indeed. However, as you will be quite familiar with them, it will not be necessary for me to do more than merely bring them to your notice.

Of the great trades vitally affected by rain from the Bay of Bengal and hence by weather reports I will take jute. Jute I take it is to Bengal what cotton is to Bombay—the staple industry. As to its importance, the average annual value of raw jute and manufactured jute fabrics shipped from Bengal is about Rs. $14\frac{3}{4}$ crores. Now, the area over which jute is grown is peculiarly affected by rain from the Bay and, therefore, sound meteorological reports, and through them sound weather forecasts are of extreme value to the whole industry, both to grower and merchant alike. Indeed, any practical proposal to improve

reports and forecasts on this account alone is worth serious consideration. Here again we have some very large figures, for the average acreage under jute cultivation is nearly 2 million acres.

Next let me take rice. Its enormous value as a food for the people comes out from the facts that the exports of rice from Bengal form but a small proportion of that used as food. It does not exceed $2\frac{1}{2}$ per cent. : $10\frac{1}{2}$ million cwts. as against over 400 million cwts. Thus the annual outturn of the rice crops in Bengal may be put at over 20 million tons raised on between 30 and 40 million acres. We all know that a deficient rainfall produces a scarcity of the food supply that may easily be disastrous : but if a coming scarcity could only be foretold in time with sufficient accuracy, it would unquestionably, in the ordinary course of trade, be anticipated and met by the trader and distributor. Consider this, and then the value of sound meteorological reports and of any practical proposal tending to make them sound becomes apparent.

Next I will take a very large trade at first sight not affected by weather reports : that in piece-goods. However, it can be no news to many of you that at home the importers and manufacturers of piece-goods closely study weather prognostications, because when crops are plentiful piece-goods are more freely purchased and *vice versâ*, and they endeavour to arrange the supply accordingly. In Bengal this means that the trade in piece-goods is closely associated with the state of the rice crops. And here again the interest involved is very large : for the average annual value of the piece-goods imported is nearly 14 crores.

Then there is also the tea industry, closely dependent on the rainfall, with an average annual export value to Bengal of about $7\frac{1}{2}$ crores. And there is also indigo with its average export value of about 3 crores. Other large industries will, no doubt, further suggest themselves to you.

But I have said enough I think in illustration of the magnitude of the interests involved and in support of the main contention that reliable weather forecasts are commercially of first rate importance, and practical proposals for improving their reliability are worth serious consideration.

The next question is: what have the Andamans and Nicobars to do with all this? Well, the existence of these islands affords the only chance we have, with the aid of wireless telegraphy, of providing that line of meteorological stations down the Bay which are so very important in the present connection, Of their importance there can be no question, as with the existing infrequent and irregular mail and no telegraph it is worth while, for statistical purposes merely, to keep up a first class meteorological station at Port Blair with a subsidiary one at Car Nicobar.

Physical difficulties there are practically none, if we follow the long line of islands intersecting the Bay from north to south from Cape Negrais on the Burma Coast to Acheen Head in Sumatra. This line is traced on the map I have brought here to show you. Along it the greatest sea distance to Port Blair is 55 miles, and onwards to Car Nicobar the greatest distance is 65 miles, and onwards again to Sumatra the greatest distance is again 65 miles.

By utilising the light-house stations on the Alguada Reef and the Cocos—ship-owners will appreciate the importance of telegraphic communication with these two places—the telegraph station on Diamond Island could be brought into touch with Port Blair with four and easily with five wireless telegraph stations: Car Nicobar with three more: all the Nicobars easily with 9 or 10 all told, and the line of stations necessary to Acheen Head would only be from 10 to 12. And remember, every wireless telegraph station can also become a meteorological reporting station, if desired. Also, besides the obligatory stations to cover sea distances as many additional wireless telegraph stations could be set up along the east and west coasts of this long string of islands, as might be desired for creating ports of call for orders, storm-warning stations and so on.

As to cost: if a workable arrangement is available as to royalties, the cost either initial or for maintenance cannot be great. At any rate, it would be very much less than that of laying a cable and maintaining it, which is the alternative.

Of course, when once one launches out on such a subject as the possibilities of wireless telegraphy at sea, a number of minor points suggest themselves for consideration. Among them are such as these.

The creation on the establishment of wireless telegraphic communication with the Andamans and Nicobars, of ports of call for orders safer and more convenient than Diamond Island, and of commercial coaling depôts more convenient than say Calcutta or Rangoon. Both could be easily achieved, if desired, as there is a surprising number of good land-locked harbours in the Andamans on both east and west coasts, safe in any weather at any season, both in, near, and far from the Penal Settlement. I could name four on the west and seven on the east coast.

Then there is the connection of outlying lighthouses, lightships and pilot brigs with the shore by means of wireless telegraphic apparatus. All this could, of course, be easily done, and to show how the arrival of wireless telegraphy has changed the old conditions, I would quote the enquiry into the disastrous loss of the passenger steamer *Sir John Lawrence*, on the 25th May, 1887, in which it was stated that Diamond Island, the most important source of information, was about 350 miles away from the presumed place of origin of the storm, *viz.*, to the west of the Andamans : the point of real importance from which to get the information necessary being the meteorological station at Port Blair, with which there was no quick means of communication

In the case of the pilot brig *Coleroon*, which was lost in the cyclone of November 1891, it was objected that weather information, however accurate and forewarning, could not reach pilot and light vessels in the estuary of the Hooghly in time of storm, as the tugs and vessels otherwise going out of the river would not then go out and thus give the warning. Wireless telegraphy would alter all this, as the state of the weather would not affect the storm signals which could be sent from the shore.

I have now been pretty well round my subject, and in concluding, I would recapitulate what appear to me to be the main points. I have tried to explain what the idea of wireless telegraphy is : what it is necessary to procure to put it into practice : how far it can be utilised when in practice : and the points connected with it on which money would have to be spent. I have next endeavoured to show how, if put into practice, a system of wireless telegraphy might benefit the commerce of this city in two matters of the greatest im-

portance relating to shipping and trade, and why for that purpose the extension of the wireless system to the Andamans and Nicobars would be of special value. In doing this, I have tried to fix your attention on the fact that it is in the means for carrying the vertical wire necessary, that the chief physical difficulty lies and on the fact that the financial difficulty lies in the royalty to be charged for the use of the patent.

And here I propose to stop. It would be a mere impertinence on my part to suggest to you what you should do towards adopting or rejecting an idea put forward with the object of benefiting your trade. I can only explain it and its possible uses to the best of my ability.

The adoption of wireless telegraphy would bring certain local administrative advantages and conveniences to Port Blair, but it would be altogether improper for me to discuss them here. In any case they appear to me to be so trifling, beside the mighty interests in your charge, that I should not propose to put them side by side.

I have not gone into the use of wireless telegraphy by private persons between mills and the city offices as individual circumstances vary so much that each case would have to be considered on its own merits, but I shall be glad to answer any questions put to me, as well as I can, though I cannot guarantee to give satisfactory answers.

And now let me close my remarks by expressing a hope that I have not disappointed you by the manner in which I have dealt with a very difficult subject in response to your invitation.

Mr. C. E. Pitman, Director-General of Telegraphs:—Mr. President and Gentlemen.—In the first place I would like to thank Colonel Temple for his most interesting lecture. The subject is a very attractive—indeed I may say a fascinating—one. But, I must say, speaking for myself, that I accept with a considerable amount of reservation the statements one sees from time to time in the newspapers about the facility and the ease with which Mr. Marconi's system of wireless telegraphy can be worked. Colonel Temple alluded to the distances across which messages may be transmitted. As regards water I find the American Navy, last year, made some experiments in the course of certain manœuvres. They had no difficulty

in working up to forty, fifty and even sixty miles. The difficulty they experienced was the want of power of concentration; that is to say the confining of messages to a certain direction, which Colonel Temple now tells us is possible. In fact in the American Navy the system was not found satisfactory; on the contrary it was found so extremely unsatisfactory that the Naval Board are establishing special schools for the teaching and developing of a system of wireless telegraphy entirely on their own lines. Another reason for their taking this action is the prohibitive nature of the royalties which are charged in connection with Mr. Marconi's system. These royalties are said to be nothing less than exorbitant. I am not in a position to say what they would amount to in this country, but for America for the few instruments required for the Navy 20,000 dollars a year were demanded. Experiments were tried with two men-of-war—the *New York* and the *Massachusetts*—and it was found that when the vessels were in line formation communication was fairly easy. But when the squadron was in fleet formation the presence of the intervening vessels intercepted the etheric waves and communication was stopped. Now as regards the land we have no absolutely reliable information. Experiments are, I believe, being made in South Africa; but even there it was found necessary to send experts to work the system. I am afraid therefore that the statement that ordinary telegraph operators can be employed can hardly be relied upon. As regards the Andamans I am very sorry Colonel Temple did not give us any details regarding the cost, or speed, or time of transit of messages. Now I see Port Blair is marked as station No. 9 on the map in front of me. I take it you would have had a message handed over from the Telegraph Office, at Diamond Island, and received at the terminal station at Port Blair. There would be seven stations between those points requiring fourteen intermediate operations. Extending to Acheen Head you would have sixteen intermediate stations which, with the two terminal stations, would necessitate thirty-four different operations. There would, therefore, I am afraid, be a great deal of delay. Then as regards the speed of the messages; as far as we know at present the speed is about six to eight words, although, I believe the Wireless Telegraph Company hope to get to a speed of about twelve words. They may, of course, get to even more than that but at present there does not seem to be much prospect of this as I understand the matter. On the other

hand a cable would be able to carry your messages at the rate of about fifteen to twenty words. In regard to connecting up a merchant's house with his office, or with a mill, I quite believe it could be done; but I should like to ask Colonel Temple whether a gentleman telegraphing from this office to Cossipore, for example, would not interfere with another gentleman who might be telegraphing from Clive Street to say Ballygunge or Barrackpur? As I understand the proposed system to connect India with the Andamans, it would be necessary to signal over a series of short sections or links, and while your message is going over the first link, you would probably be unable to signal over the next link, because of the effect of these uncontrolled etheric waves. As regards experiments Russia, France and America are making experiments, and I have here a list of instruments on sale by a French firm. In India we have not done much up to the present, but if we could possibly introduce the instruments, they would be of the very greatest value in connecting Saugor Island with the Sandheads, and for supplementing our cable, between India and the coast of Ceylon. I think the cost of a cable between Port Blair and Rangoon would work out to about £70,000, exclusive of maintenance, and signalling staff. With regard to maintenance and working expenses of a wireless telegraph system it should be borne in mind that an ordinary telegraph signaller employed in connection with the existing Indian telegraph system can be obtained at about Rs. 110 per month; while with the delicate, complicated, and to an inexperienced man, somewhat dangerous Marconi instruments you would require men of much higher attainments. I say dangerous because when you take a current of ·02 ampere as being sufficient to work an ordinary telegraph instrument you have to take about 8 amperes to work your Marconi instrument. Now suppose anyone not an expert was handling one of these latter instruments, perhaps our President here to-day, why his experiences might be as unpleasant as those of the flying-fox he told me of the other day which got upon some electric light wires. I have nothing to add except to thank the gentlemen present for the patience with which they have listened to my remarks.

Sir Patrick Playfair :—Mr. President and Gentlemen,—The subject of the lecture to which we have listened with a great amount of interest, is one which has had the earnest attention of members

of the Bengal Chamber of Commerce for some years. I think you will find a lengthy correspondence on the subject in Volume II, of the Chamber's Reports for the years 1891-92 and 1892-93. I should like to make a few remarks on what Colonel Temple has said respecting the commercial aspect of the subject and its importance. The foundering of the *Sir John Lawrence* and the deplorable loss of life connected with it brought into prominence the necessity of telegraphic communication with the Andaman Islands. Mr. A. Pedler, the Meteorological Reporter to the Government of Bengal, stated in his evidence before the Marine Court of enquiry on the loss of that steamer, that the usual birth-place of the cyclones which run to the head of the Bay of Bengal is to the west of the Andaman Islands, and he stated that he considered it was very advisable, if not necessary, that there should be telegraphic communication between the Andamans and the mainland. He also admitted in his evidence that this had been reported by the Department on several occasions to the Government of India. The Meteorological Reporter to the Government of India in May 1890 also gave it as his opinion that there should be telegraphic communication between the Andamans and the mainland, as, although cyclonic storms were of rare occurrence in the Andaman seas, the barometrical indications were pronounced and were most useful in enabling the Department to announce the approach of coming storms. The Chamber of Commerce took up the subject, and in view of these facts considered that it was unsatisfactory that there should not be telegraphic communication with the Andamans to safeguard the interests of the Provinces bordering on the Bay of Bengal, and the Chamber has been strongly of the opinion that the want of telegraphic communication is unsatisfactory and fraught with danger to the large fleet which, as Colonel Temple has shown, traverses the Bay. The Government of India, in replying to this representation, while admitting that telegraphic communication would be useful, did not consider that it was of such urgent necessity as to justify the large expenditure involved, and, as the President has told us, they considered the cost prohibitive. The cost according to an unofficial estimate received by the Chamber was about £170 per mile of cable, which roughly amounted to £170,000 or £200,000 for the entire length of cable. I have never been able to bring myself to believe, Gentlemen, that the consideration of cost

was one that justified the Government of India in denying a safeguarding to the public and their possessions. Colonel Temple has referred to the transfer which has taken place in tonnage from sailing ships to steamers, and he has also alluded to the facility with which steamers might be able to get at Point de Galle, Madras, Calcutta and other places, reliable reports and forecasts of the weather in the Bay, if there were telegraphic communication with the Andamans. It is needless for me to refer to the catastrophe with appalling consequences which might occur, were a large passenger steamer to go out of Calcutta or pass Point de Galle or Madras, and run into a cyclone, which might have been prevented if the Commander had received timely warning from the Andamans of storm indications. I was therefore much interested in associating myself with the enquiry Colonel Temple made last summer with regard to the practical application of the Marconi system to provide telegraphic communication between the Andamans and the mainland. As my friend Mr. Pitman has pointed out, there are many questions of detail which must be gone into and thought out before the scheme can be accepted for adoption; but I think that the information Colonel Temple has so clearly put before us to-day encourages us to think and believe that it may be applicable, and that this warrants the Government of India and the commercial community giving their closest attention to the proposal. I found in 1895, when I was at home, that ship-owners were in favor of the establishment of telegraphic communication between the Andamans and the mainland, but they represented that the burdens upon shipping were already so very heavy that any further tax to obtain the desired facility would be a very serious consideration. I would remind you in regard to this point that there is a large surplus revenue received from the Burma Coast Light Dues. I have not had time to get the figures for to-day's meeting, but from a note upon my old file, I find that between 1878 and 1894 the surplus revenue from this source amounted to nearly 10 lakhs of rupees. There is also another fund about which the public knows little, but, which it is believed, produces a large surplus to the general revenues or the local revenues, and that is the surplus derived from the Pilot service on the river. I throw out the hint that the surplus from these two funds might be sufficient to provide interest on the capital cost of such a system as Colonel Temple has suggested, which is very much be-

low the cost of the cable originally proposed. In connection with the possibility of establishing a system of communication between our Mills and Calcutta offices, I had specially in view the Gourepore Jute Mills in which I am interested. This Mill is situated at a distance of about 26 miles from Calcutta. I found from Colonel Temple's enquiries that Mr. Marconi has successfully carried on communication between two Church spires and, therefore, it seems possible that the chimney stack of a Mill and a pole erected on the top of an office in Calcutta might be serviceable supports for the instruments for communication always provided that the Telegraph Department of the Government of India did not object to the use of the Marconi system, but this consent would probably have to be obtained. I have not been able, so far, to formulate an estimate of cost, as much will depend upon the Royalty that will be payable to Mr. Marconi or his representatives, and which has not yet been ascertained. I have put one or two questions on paper which I should like to hand to Colonel Temple ; the answers to these will, I think, be of interest to the meeting and, rather than detain you longer, I will ask Colonel Temple to kindly deal with them in the course of his general reply.

THE REV. FATHER LAFONT.—Mr. President and Gentlemen—I must say that I was extremely interested by the most lucid explanation of a difficult subject which has been given us by Colonel Temple this afternoon. But I confees I am not quite so sanguine as he is about the actual feasibility of the scheme. No doubt, in a few years something of the kind might be thought of, but in the present stage of our knowledge I feel rather inclined to side with the Director-General of Telegraphs. I have worked a little with wireless telegraphy, and I find it is not so reliable as the reports in the newspapers about Mr. Marconi's doings seem to suggest. I do not know what sort of coherers or radiol-conductors Marconi uses now, but I know his first coherers were absolutely unreliable. I got half a dozen of them from Berlin and they all got out of order within three weeks. Several of them came to me out of order. I suppose, therefore, that during transit their qualities changed. Even those that did work satisfactorily for about 8 or 10 days were absolutely useless afterwards ; they are now in my possession and occasionally they work by fits and starts. So until a reliable coherer is invented, I think wireless

telegraphy would be very limited in its application. However, there is some cheering news, as some very careful experiments and original researches are being carried out in the Presidency College here by Professor J. C. Bose. He has shown me one or two things in the way of coherers which simply astounded me. We generally accepted the theory that a coherer acts by the loose powder which constitutes it, and is almost a non-conductor, becoming by a sort of cohesion, and the impact of the etheric waves, a good conductor. Now Professor Bose showed me a coherer which was a perfect conductor before the etheric waves struck it, and was *no conductor at all* after the etheric waves had struck it. One class, therefore, becomes a good conductor by the impact of the waves, and another class becomes practically a perfect insulator by the same impact: so you see the question is very far indeed from being entirely elucidated. I daresay for small distances the system might work fairly well, but I am afraid the royalties are prohibitive. But even in that line there is some cheering news. There are two or three other systems besides that of Signor Marconi which are being studied in Germany. There are already lecture instruments which are for sale in connection with these systems, so that probably we shall not always be dependent on Signor Marconi. We all of us hail with the greatest pleasure the advance of applied science in every direction, and I was greatly impressed with the importance of such a line of communication as that pointed out by Colonel Temple. There is, no doubt, that a great deal of valuable information could be communicated to the commercial world if we knew a little more about the storms and cyclones which originate near the Andamans. I am not myself a believer to any very great extent in meteorological forecasts, but I am a very firm believer in watching the movements of storms after they have been actually seen, and of calculating their probable path.

Sir Alfred Gaselee.—I should like to say, Sir, with your permission, with what great interest we have watched, from a military point of view, the experiements which are, I think, likely to be brought to a successful termination in connection with wireless telegraphy. Of course to a body of gentlemen like those present to-day, it is needless for me to point out the many advantages which would accrue from a military point of view, if we could only get some such

system as that indicated by Colonel Temple, to work successfuly. All interested in military matters would be very pleased if such a result could be attained.

COLONEL TEMPLE.—In attempting to give some sort of reply to the criticisms which have been made I will take the statements made by Mr. Pitman and Father Lafont together. In the first place I would say that I am exceedingly glad to find that my remarks have been subjected to criticism, because it is only when doubts are raised, as to the efficiency of what has already been achieved, that anything in the direction of perfecting such a system as that I am proposing is likely to be attempted. My object has been to point out to you the great importance of getting wireless telegraphy established if we can, and not to advocate any particular system. I am also anxious to stimulate a discussion on the subject.

Now I will first deal with the remarks which have been made regarding the speed at which the Marconi system can be worked. I have seen the system worked at several places. I have frequently been at the North Foreland and at Dover where there are or have been wireless telegraph stations; and I should say that the speed is about the same as ordinary cable speed. Mr. Pitman thinks it is very much less, but my experience is that it is very much the same. Mr. Pitman was, I am afraid, a little wrong about the number of stations which will be required at the Andamans and Nicobars. The map on the screen is one which I drew up some time ago when things were not nearly so advanced as they are now. At that time I thought it would take eighteen stations to carry out the work from Diamond Island to Acheen Head. But if you look at the map carefully you will see that a large number of the eighteen stations are on the land at places which may be connected together by an ordinary telegraph wire. In fact, it will be possible to go all down the Andamans with an ordinary telegraph wire. I have, therefore, come to the conclusion that the number of stations may be greatly reduced; indeed it will be as I have already said, possible to work the system with four only, as far as any part of the Andamans. The greater difficulty to overcome is the 55 sea miles between Alguada Reef, and Preparis Island, and the 65 sea miles between Little Andaman and Car Nicobar.

We have heard this afternoon that the Marconi instruments are dangerous. If that be so, I can only say that I have stood beside them very often for long periods, and I have never heard of anybody coming to grief over them. There is an instrument working all day long at the North Foreland; or at least there was until the French Government ordered the Wireless Telegraph Company's mast at Wimereux near Boulogne, to be removed. This they did, I believe, because they were afraid that British officials would tap their messages, and thus get possession of information intended to be secret. I never heard of any accidents occuring at the North Foreland in connection with the instruments, nor at Dover nor elsewhere.

Then Mr. Pitman told us he was sorry I had said so little about the cost of the system. I think myself the cost would come to about £250 for each station, plus the buildings you would have to put up. It seems to me to be quite a trifling amount compared with the lowest possible estimate of the cost of a cable. With respect to royalties I think the commercial gentlemen present will agree with me that that is really a matter of commercial adjustment. If the people wanting the work are less powerful than those who have it to give the royalties are certain to be high; but, if they are more powerful, the royalties are pretty certain to go down. It is, I think, a matter which will adjust itself in course of time.

Now Sir Patrick Playfair has asked me certain questions. The first is: "Does the earth's curvature or an intervening hill affect wireless telegraphy?"

With all due deference to Mr. Pitman, and the other scientific gentlemen present I should say no; it has no practical effect.

The second question is: "Are neighbouring wires—telegraph or telephone—affected by or do they affect wireless telegraphy?"

Well that of course is a very practical question to ask; and in answer to it I should say from what I have seen myself that they do not, and I will presently give a reason from what I saw done.

The third question is: "Does it make any difference in the height of the pole required, if it is on a cliff or high above sea level?"

The position of the pole above sea level makes no difference whatever.

The fourth question is: "Does it matter if two communicating poles are at different heights above sea level?"

It makes no difference.

In regard to these four questions I have noted down an experiment actually performed by Professor Fleming which will, I think, answer some of the objections I have heard raised by Mr. Pitman and Father Lafont. The object of Professor Fleming was to test the system in every practicable way. This is his own version of what I saw done myself:—

"It has been frequently asserted that the practical utilisation of ether waves, in wireless telegraphy would be limited by the difficulty of transmitting them through rock masses, buildings and other material obstacles. Experiment, however, proves that this is not the case, at least with the very long waves employed by Mr. Marconi. An exceedingly interesting experiment to illustrate this non-interference was tried on August 16th, 1899, at Dover, between the Dover Town Hall and the South Foreland. The Town Hall at Dover stands in the centre of the town and is surrounded by high cliffs. The Castle Rock rises on the east side to more than 400 feet above the level on which the Town Hall stands, and a continuous chalk cliff extends between the Castle and the South Foreland for a distance of four miles. At this latter place is one of the signalling stations of the Wireless Telegraph and Signal Company, and a mast and signalling wire, 150 feet high, was established there in April, 1899, for experimental purposes, for communication between the South Foreland, the East goodwin Lightship, and a station at Wimereux, on the French coast. At the suggestion of the author the Wireless Telegraph Company kindly undertook to make an experiment as follows:—The Town Hall tower is about 65 feet in height, and on this tower, a flagstaff, some 45 feet high is erected. A signalling wire was attached to this flagstaff, and the end brought down into the hall. Employing the Marconi apparatus it was then found that not the slightest difficulty existed in communicating through or over the Castle Rock, with the station at South Foreland, and even with the Goodwin Lightship 12 miles beyond. The immense mass of chalk cliff lying between the Town Hall, Dover, and the South Foreland, appears to offer not the slightest obstacle to the passage of ether waves to or from the wire attached to the Town Hall flagstaff. The above described experiment only confirms many others made by Mr. Marconi, all of them showing that rock masses of very considerable size intervening between two stations do not, in the least, affect the freedom of communication by ether wave telegraphy."

In further explanation I would say that the Dover Town Hall is surrounded by Electric Tramways, it is lighted by electricity and it has a Telegraph and Telephone station in it. So that electric disturbance of every kind might be expected within it or in its neighbourhood. The communicating wireless telegraphic instruments were of differing heights and materials placed at differing heights on and above sea

level, and were separated by high intervening and overtopping hills of some width. The experiment was, therefore, a most searching one.

Well, of course, when I quote the report on an experiment by Professor Fleming, the scientific gentlemen present will be perfectly well aware that I am quoting one of the greatest authorities on the subject in England ; and I do not think that Professor Fleming is likely to have a preference for Signor Marconi over Sir William Preece or the German inventors of wireless telegraphic systems. I think that quotation answers to a great extent, the points raised in Sir Patrick Playfair's first four questions, and one of the points raised by Mr. Pitman and Father Lafont. He then asks :—

"How far can you at Port Blair foretell weather from local indications ?"

If the gentlemen present, will permit me, I would like to tell them a story upon this point. It happened about three years ago when one of the Asiatic steamers came into Port Blair from Rangoon, that I sent for the Commander and I asked him if he had any knowledge of a cyclone brewing. He was going to Madras and he said he thought there was a storm getting up somewhere in the direction he was going. I asked him if he would communicate with me later, on his return, and let me know exactly what happened to him on the way down to Madras. I also said that I would try from Port Blair to trace out the path of the cyclone we expected, while he was away, with the help of the very sound information we get on these points from the Meteorological Department of Government. Well the storm came pretty close to us, perhaps within a hundred miles ; and sitting in my house at Port Blair with constant weather reports from the Meteorological station down below, and with the help of books and the reports of the previous known cyclones, I mapped out what I thought would be the probable course of the storm, and where I thought it would be every twenty four hours. When the Captain came back we compared notes and I found that while the storm was at sea I had indicated its course pretty accurately. But I had calculated that it would strike at Coconada, whereas it actually struck at, I think, Gopalpur somewhat farther north. Its course must have got deflected somewhere near the mainland. I merely tell this story in order to show how accurately weather prognostications may be taken at Port Blair.

Sir Patrick Playfair's sixth question is :—

" Could wireless telegraphy be utilised for reporting the progress of ships up or down the river Hughli, at points not now reached by the existing telegraph ? "

That I take it means that the existing telegraph runs from point to point of the river, leaving out the bends. If I apprehend the question aright, I should say there would be no difficulty with the help of wireless telegraphy of reporting along the bends at any desired point.

The seventh question is :—

" And from lightships and so on in the Estuary ? "

I have already said enough to show that one of the best, perhaps *the* best, use of wireless telegraphy would be to communicate with lightships and pilot brigs ; and I think those who have been kind enough to criticise my remarks will agree with me that this is the most likely use to which it can be put. It will, moreover, probably be the first use to which it will be put in India even if we cannot get it down to the Andamans.

Sir Patrick Playfair's last question is :— .

" Could communication be kept up with tugs taking ships out to sea, while moving about the Estuary and beyond other means of communication ? "

That will be a matter of very great importance to the people connected with shipping. The answer is in the affirmative, because the fact of the vessel moving will not affect the messages. The tug will receive them just as easily when it is in motion as when it is at anchor.

I think I have now replied to all the questions put to me and to the criticisms which have been made, as far as it is possible to reply to them off hand. And I would like to express once more my gratitude to the gentlemen who have put the questions and made the criticisms.

SIR PATRICK PLAYFAIR proposed and the HON'BLE MR. D. F. MACKENZIE seconded a hearty vote of thanks to COLONEL TEMPLE for his interesting and instructive lecture.

The proposal was carried with acclamation.

The meeting then separated.

[500—19-2-1900].